Issued Date: Aug. 17, 2005
Model No.: V201B1 - L01

CHI MEI OPTOELECTRONICS CORP.

Approval

TFT LCD Approval Specification

MODEL NO.: V201B1 - L01

Customer:

Approved by:

Note:

LCD TV Head Division	
AVP	郭振隆

QRA Dept.	TVHD / PDD		
	DDIII	DDII	DDI
Approval	Approval	Approval	Approval
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LCD TV Marketing and Product Management Division	
Product Manager	張耀升　　陳立宜

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REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 2.0	July 15,'05	All	All	Approval Specification was first issued.
Ver 2.0	July 15,'05	All	All	RoHS Compliance
Ver 2.1	Aug. 01,'05	4	1.4	Update 1.4 GENERAL SPECIFICATIONS Surface Treatment 　　　　Hardness : 3H, Anti-Glare
		4	1.5	Update 1.5 MECHANICAL SPECIFICATIONS Depth(D)　Min.: 36.45;42.75 　　　　　　Max.:38.45;44.75 Weight 　　　　Min.:2000
Ver 2.1	Aug. 01,'05	9	3.2.2	Modify 3.2.2 INVERTER CHARACTERISTICS(Ta=25± 2 ºC) Backlight Turn on Voltage　Min.:2400
Ver 2.1	Aug.01,'05	19	6.1	Update 6.1 INPUT SIGNAL TIMING SPECIFICATIONS LVDS Receiver Clock Frequency　Min.:(65) Horizontal Active Display Term Total　Min.:(1442)
Ver 2.1	Aug. 01,'05	30	11	Update 11 MECHANICAL CHARACTERISTICS 圖面
		31	11	Update 11 MECHANICAL CHARACTERISTICS 圖面
		32	11	Update 11 MECHANICAL CHARACTERISTICS 圖面

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1. GENERAL DESCRIPTION

1.1 OVERVIEW

V201B1- L01 is a 20.1" TFT Liquid Crystal Display module with 5-CCFL Backlight unit and 1ch-LVDS interface. This module supports 1366 x 768 WXGA format and can display true 16.2M colors (6-bits+FRC). The inverter module for backlight is built-in.

1.2 FEATURES

- High brightness (500 nits)

- High contrast ratio (1000:1)

- Fast response time (8ms)

- High color saturation NTSC 75%

- WXGA (1366 x 768 pixels) resolution

- DE (Data Enable) only mode

- LVDS (Low Voltage Differential Signaling) interface

- Optimized response time for 50/60 Hz frame rate

- Ultra wide viewing angle: 176(H)/176(V) (CR>20) Super MVA technology

- 180 degree rotation display option

1.3 APPLICATION

- TFT LCD TVs

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	444.633(H) x 249.984 (V) (20.1" diagonal)	mm	(1)
Bezel Opening Area	450.7 (H) x 256 (V)	mm	
Driver Element	a-si TFT active matrix	-	
Pixel Number	1366 x R.G.B. x 768	pixel	
Pixel Pitch (Sub Pixel)	108.5 (H) x 325.5 (V)	um	
Pixel Arrangement	RGB vertical stripe	-	
Display Colors	16.2M	color	
Display Operation Mode	Transmissive mode / Normally black	-	
Surface Treatment	Hardness : 3H, Anti-Glare	-	

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	472.6	473.3	474	mm	
	Vertical(V)	276	276.7	277.4	mm	
	Depth(D)	36.45	37.45	38.45	mm	To PCB cover
	Depth(D)	42.75	43.75	44.75	mm	To inverter cover
Weight		2000	2200	2400	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

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2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	50	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.0	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.

    (a) 90 %RH Max. (Ta $\leq$ 40 ºC).

    (b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

    (c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 60 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 60 ºC. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 500 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

Relative Humidity (%RH)

Temperature (ºC)

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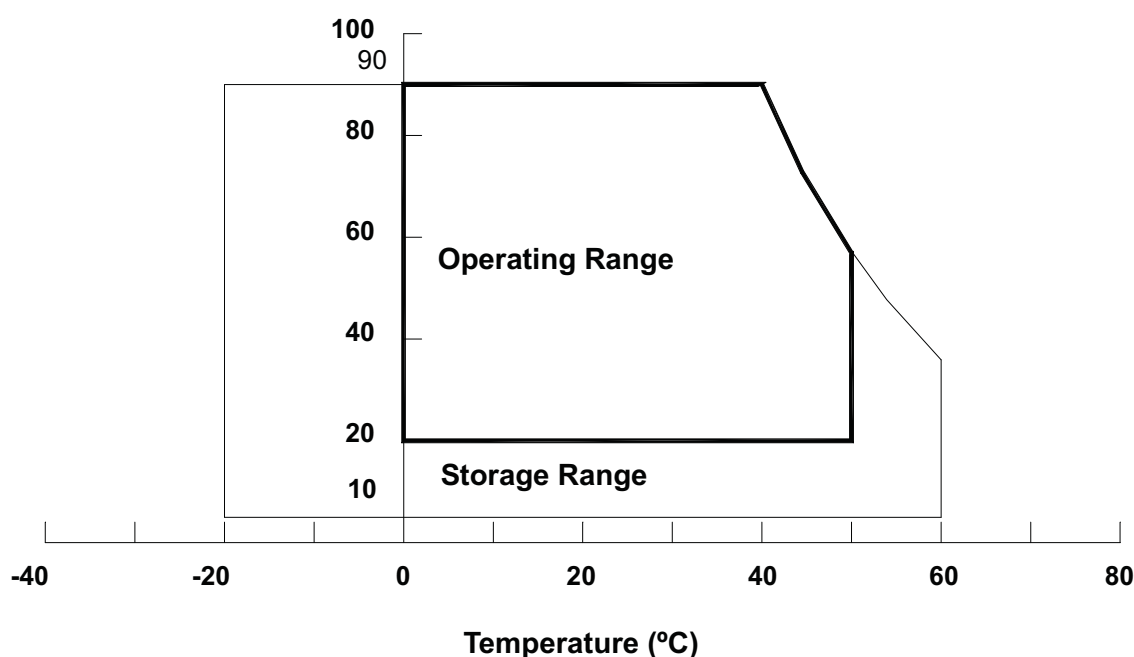
2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	(-0.3)	(6.0)	V	(1)
Input Signal Voltage	V_{IN}	-0.3	(3.6)	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V_W	—	3000	V_{RMS}	
Power Supply Voltage	V_{BL}	0	30	V	(1)
Control Signal Level	—	-0.3	7	V	(1), (3)

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under normal operating conditions.

Note (2) No moisture condensation or freezing.

Note (3) The control signals includes Backlight On/Off Control, Internal PWM Control.

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3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta = 25 ± 2 ℃

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	4.5	5.0	5.5	V	(1)
Power Supply Ripple Voltage		V_{RP}	-	-	100	mV	
Rush Current		I_{RUSH}	-	-	2.8	A	(2)
Power Supply Current	White	I_{CC}	-	1.25	-	A	(3)
	Black		-	0.78	-	A	
	Vertical Stripe		-	1.05	-	A	
LVDS Interface	Differential Input High Threshold Voltage	V_{LVTH}	-	-	+100	mV	
	Differential Input Low Threshold Voltage	V_{LVTL}	-100	-	-	mV	
	Common Input Voltage	V_{LVC}	1.125	1.25	1.375	V	
	Terminating Resistor	R_T	-	100	-	ohm	
CMOS interface	Input High Threshold Voltage	V_{IH}	2.7	-	3.3	V	
	Input Low Threshold Voltage	V_{IL}	0	-	0.7	V	

Note (1) The module should be always operated within above ranges.

Note (2) Measurement Conditions:
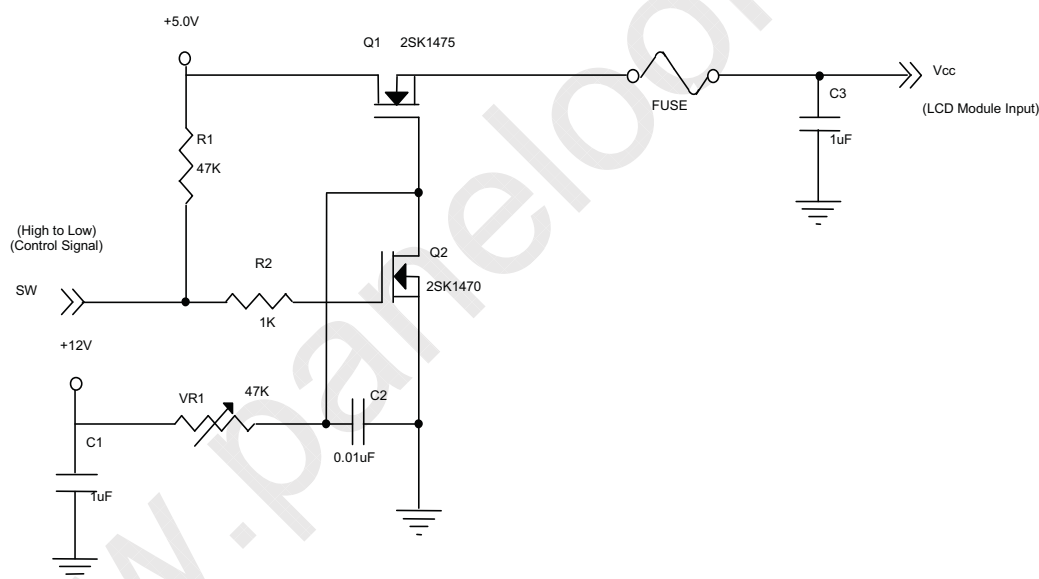
Vcc rising time is 470us

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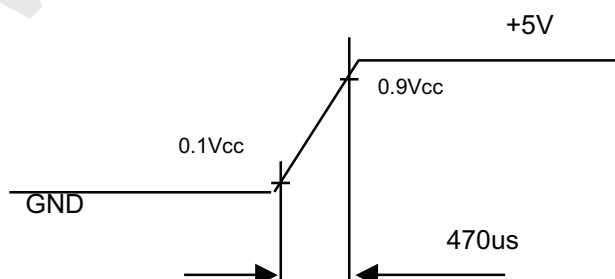
Note (3) The specified power supply current is under the conditions at Vcc = 5 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern
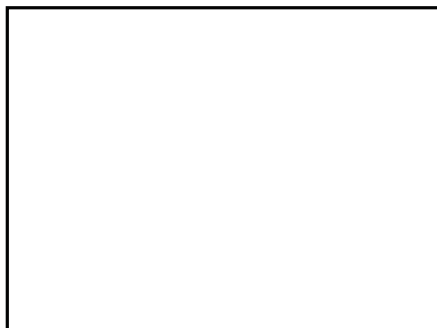
Active Area

b. Black Pattern

Active Area

c. Vertical Stripe Pattern
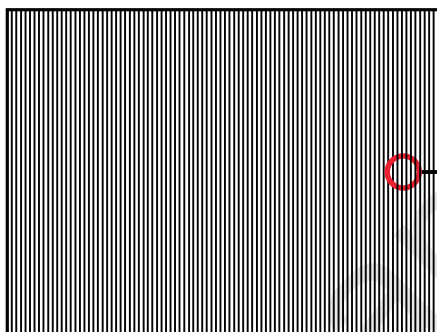
Active Area
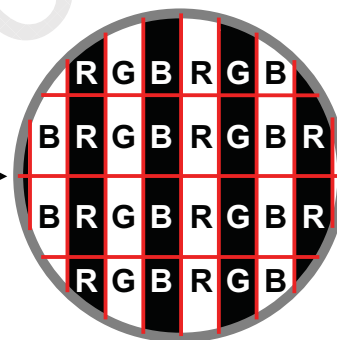
3.2 BACKLIGHT INVERTER UNIT

3.2.1 CCFL (Cold Cathode Fluorescent Lamp) CHARACTERISTICS (Ta = 25 ± 2 ºC)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Voltage	V_W	-	1610	-	V_{RMS}	I_L = 5.5mA
Lamp Current	I_L	5.0	5.5	6.0	mA_{RMS}	(1)
Lamp Starting Voltage	V_S	-	-	2400	V_{RMS}	(2), Ta = 0 ºC
		-	-	2250	V_{RMS}	(2), Ta = 25 ºC
Operating Frequency	F_O	40	-	70	KHz	(3)
Lamp Life Time	L_{BL}	50,000	60,000	-	Hrs	(4)

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3.2.2 INVERTER CHARACTERISTICS (Ta = 25 ± 2 ℃)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Consumption	P_{BL}	-	46	-	W	(5), I_L = 5.5mA
Input Voltage	V_{BL}	22.8	24	25.2	V_{DC}	
Input Current	I_{BL}	-	1.9	-	A	Non Dimming
Input Ripple Noise	-	-	-	500	mV_{P-P}	V_{BL}=22.8V
Backlight Turn on Voltage	V_{BS}	2400	-	-	V_{RMS}	Ta = 0 ℃
Oscillating Frequency	F_W	49	52	55	kHz	
Dimming frequency	F_B	150	160	170	Hz	
Minimum Duty Ratio	D_{MIN}	-	20	-	%	

Note (1) Lamp current is measured by current probe (Tekronix P6022) with Tekronix oscilloscope as shown below, and lamp current I_L = Irms:(This is temporary measurement method.)

Electric current direction of current probe

LCD Module — HV (Pink) / HV (White) / HV (Pink) / HV (White) / HV (Pink) / HV (White) / HV (Pink) / HV (White) / HV (Pink) / HV (White) — Irms — Inverter

Note (2) The lamp starting voltage V_S should be applied to the lamp for more than 1 second under starting up duration. Otherwise the lamp could not be lighted on completed.

Note (3) The lamp frequency may produce interference with horizontal synchronous frequency of the display input signals, and it may result in line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (4) The life time of a lamp is defined as when the brightness is larger than 50% of its original value and the effective discharge length is longer than 80% of its original length (Effective discharge length is defined as an area that has equal to or more than 70% brightness compared to the

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brightness at the center point of lamp.) as the time in which it continues to operate under the condition at Ta = 25 $\pm$2℃ and I_L = 5.0 ~6.0 mA$_{RMS}$.
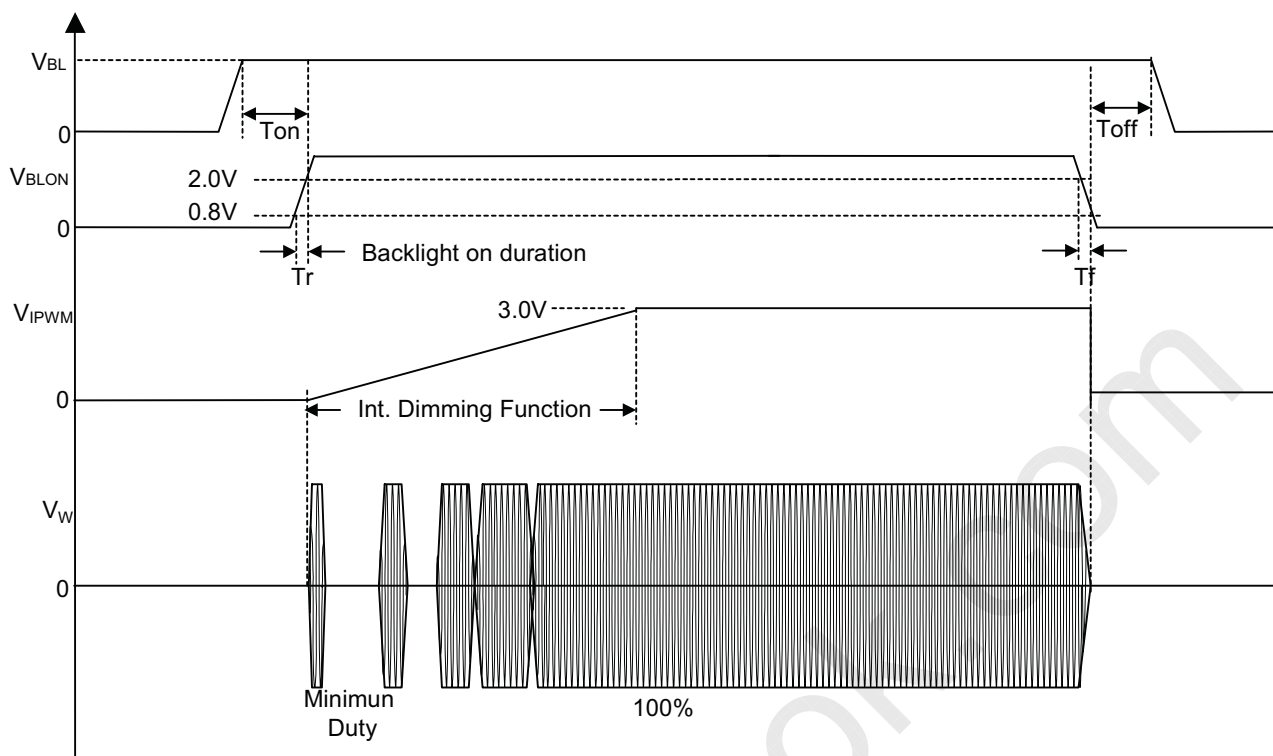
Note (5) The power supply capacity should be higher than the total inverter power consumption P$_{BL}$. Since the pulse width modulation (PWM) mode was applied for backlight dimming, the driving current changed as PWM duty on and off. The transient response of power supply should be considered for the changing loading when inverter dimming.

3.2.3 INVERTER INTERFACE CHARACTERISTICS

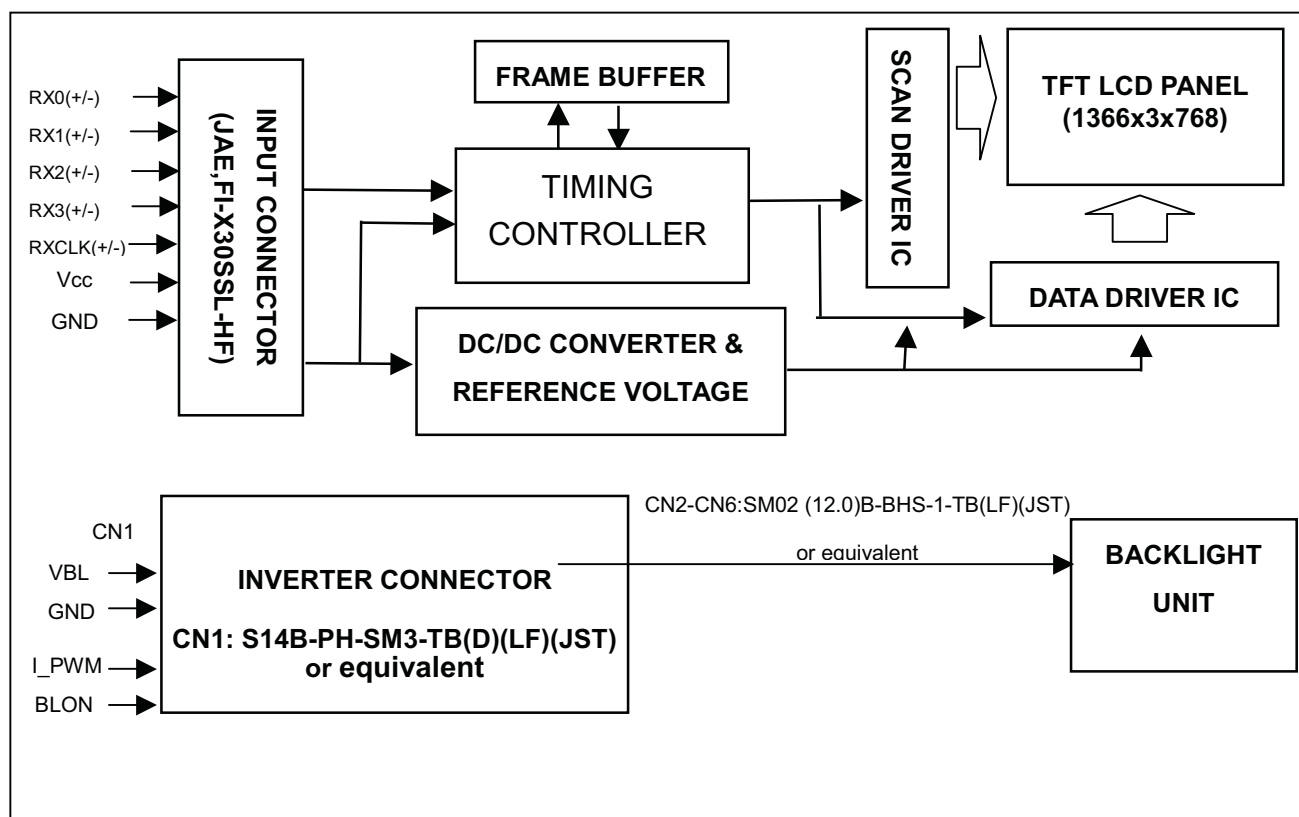| Parameter		Symbol	Test Condition	Value			Unit	Note
				Min.	Typ.	Max.		
On/Off Control Voltage	ON	V$_{BLON}$	—	2.0	—	5.0	V	
	OFF		—	0	—	0.8	V	
Internal PWM Control Voltage	MAX	V$_{IPWM}$	—	—	—	3.0	V	maximum duty ratio
	MIN			—	0	—	V	minimum duty ratio
Control Signal Rising Time		T$_r$	—	—	—	100	ms	
Control Signal Falling Time		T$_f$	—	—	—	100	ms	
PWM Signal Rising Time		T$_{PWMR}$	—	—	—	50	us	
PWM Signal Falling Time		T$_{PWMF}$	—	—	—	50	us	
Input impedance		R$_{IN}$	—	1	—	—	MΩ	
BLON Delay Time		T$_{on}$	—	1	—	—	ms	
BLON Off Time		T$_{off}$	—	1	—	—	ms	

Note (1) The power sequence and control signal timing are shown as the following figure.

Note (2) The power sequence and control signal timing must follow the figure below. For a certain reason, the inverter has a possibility to be damaged with wrong power sequence and control signal timing.

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4. BLOCK DIAGRAM

4.1 TFT LCD MODULE

RX0(+/-)
RX1(+/-)
RX2(+/-)
RX3(+/-)
RXCLK(+/-)
Vcc
GND

INPUT CONNECTOR
(JAE,FI-X30SSL-HF)

FRAME BUFFER

TIMING CONTROLLER

DC/DC CONVERTER & REFERENCE VOLTAGE

SCAN DRIVER IC

TFT LCD PANEL (1366x3x768)

DATA DRIVER IC

CN1
VBL
GND
I_PWM
BLON

INVERTER CONNECTOR

CN1: S14B-PH-SM3-TB(D)(LF)(JST) or equivalent

CN2-CN6:SM02 (12.0)B-BHS-1-TB(LF)(JST)
or equivalent

BACKLIGHT UNIT

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5. INTERFACE PIN CONNECTION

5.1 TFT LCD MODULE

CNF1 Connector Pin Assignment

Pin No.	Symbol	Description	Note
1	NC	No Connection	(2)
2	RPF	Display Rotation	(3)
3	NC	No Connection	(2)
4	NC	No Connection	
5	NC	No Connection	
6	ODSEL	Overdrive Lookup Table Selection	(4)
7	NC	No Connection	(2)
8	GND	Ground	
9	RX0-	Negative transmission data of pixel 0	
10	RX0+	Positive transmission data of pixel 0	
11	RX1-	Negative transmission data of pixel 1	
12	RX1+	Positive transmission data of pixel 1	
13	RX2-	Negative transmission data of pixel 2	
14	RX2+	Positive transmission data of pixel 2	
15	RXCLK-	Negative of clock	
16	RXCLK+	Positive of clock	
17	RX3-	Negative transmission data of pixel 3	
18	RX3+	Positive transmission data of pixel 3	
19	GND	Ground	
20	NC	No Connection	(2)
21	NC	No Connection	
22	NC	No Connection	
23	NC	No Connection	
24	GND	Ground	
25	GND	Ground	
26	GND	Ground	
27	VCC	Power supply: +5V	
28	VCC	Power supply: +5V	
29	VCC	Power supply: +5V	
30	VCC	Power supply: +5V	

Note (1) Connector Part No.: FI-X30SSL-HF(JAE) or compatible

Note (2) Reserved for internal use. Left it open.

Note (3) Low : normal display (default), High : display with 180 degree rotation

Note (4) Overdrive lookup table selection. The Overdrive lookup table should be selected in accordance with the frame rate to optimize image quality.

ODSEL	Note
L	Lookup table was optimized for 60 Hz frame rate.
H	Lookup table was optimized for 50 Hz frame rate.

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5.2 BACKLIGHT UNIT

The pin configuration for the housing and leader wire is shown in the table below.

CN2-CN6 (Housing): BHR-04VS-1 (JST)

Pin No.	Symbol	Description	Wire Color
1	HV	High Voltage	Pink
2	HV	High Voltage	White

Note (1) The backlight interface housing for high voltage side is a model BHR-04VS-1, manufactured by JST.

The mating header on inverter part number is SM02(12.0)B-BHS-1-TB(LF).

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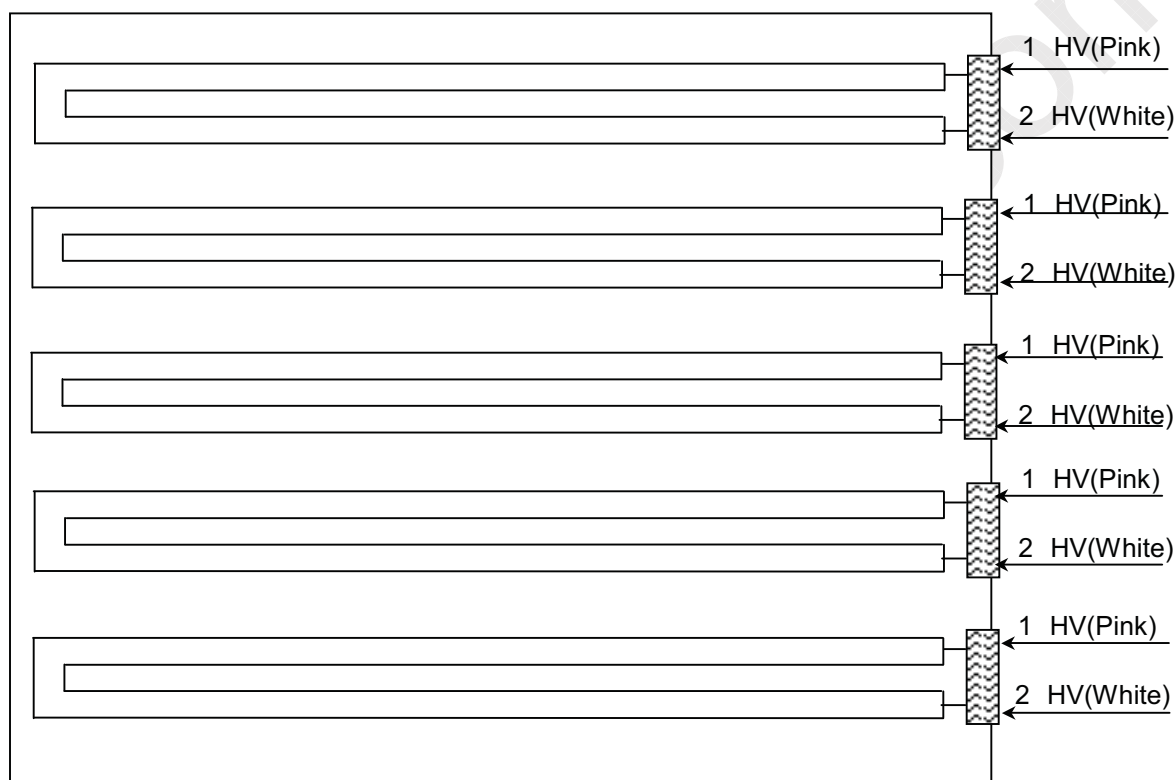
5.3 INVERTER UNIT

CN1(Header):S14B-PH-SM3-TB(D)(LF)(JST) or equivalent.

Pin No.	Symbol	Description
1	VBL	+24V Power input
2		
3		
4		
5		
6	GND	Ground
7		
8		
9		
10		
11	NC	NC
12	NC	NC
13	I_PWM	Internal PWM control signal
14	BLON	Backlight on/off control

CN2-CN6(Header): SM02(12.0)B-BHS-1-TB(LF)(JST) or equivalent

Pin No.	Symbol	Description
1	CCFL HOT	CCFL high voltage
2	CCFL HOT	CCFL high voltage

Note (1) Floating of any control signal is not allowed.

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5.4 BLOCK DIAGRAM OF INTERFACE
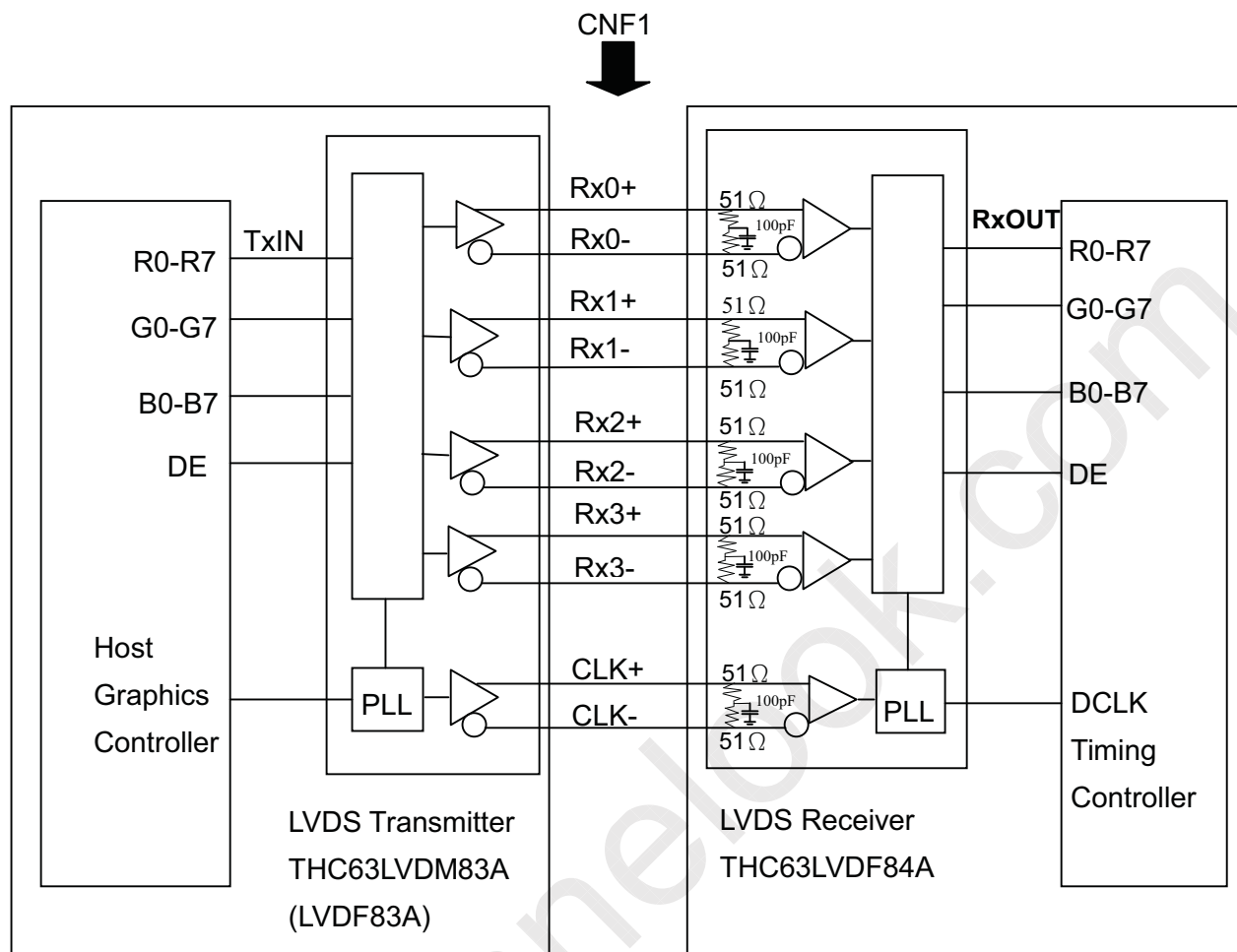
R0~R7   : Pixel R Data   ,

G0~G7   : Pixel G Data   ,

B0~B7   : Pixel B Data   ,

DE   : Data enable signal

Note (1) The system must have the transmitter to drive the module.

Note (2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is
used differentially.

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5.5 LVDS INTERFACE

	SIGNAL	TRANSMITTER THC63LVDM83A		INTERFACE CONNECTOR		RECEIVER THC63LVDF84A		TFT CONTROL INPUT
		PIN	INPUT	Host	TFT-LCD	PIN	OUTPUT	
24bit	R0	51	TxIN0			27	Rx OUT0	R0
	R1	52	TxIN1			29	Rx OUT1	R1
	R2	54	TxIN2	TA OUT0+	Rx 0+	30	Rx OUT2	R2
	R3	55	TxIN3			32	Rx OUT3	R3
	R4	56	TxIN4			33	Rx OUT4	R4
	R5	3	TxIN6	TA OUT0-	Rx 0-	35	Rx OUT6	R5
	G0	4	TxIN7			37	Rx OUT7	G0
	G1	6	TxIN8			38	Rx OUT8	G1
	G2	7	TxIN9			39	Rx OUT9	G2
	G3	11	TxIN12	TA OUT1+	Rx 1+	43	Rx OUT12	G3
	G4	12	TxIN13			45	Rx OUT13	G4
	G5	14	TxIN14			46	Rx OUT14	G5
	B0	15	TxIN15	TA OUT1-	Rx 1-	47	Rx OUT15	B0
	B1	19	TxIN18			51	Rx OUT18	B1
	B2	20	TxIN19			53	Rx OUT19	B2
	B3	22	TxIN20			54	Rx OUT20	B3
	B4	23	TxIN21	TA OUT2+	Rx 2+	55	Rx OUT21	B4
	B5	24	TxIN22			1	Rx OUT22	B5
	DE	30	TxIN26			6	Rx OUT26	DE
	R6	50	TxIN27	TA OUT2-	Rx 2-	7	Rx OUT27	R6
	R7	2	TxIN5			34	Rx OUT5	R7
	G6	8	TxIN10			41	Rx OUT10	G6
	G7	10	TxIN11			42	Rx OUT11	G7
	B6	16	TxIN16	TA OUT3+	Rx 3+	49	Rx OUT16	B6
	B7	18	TxIN17			50	Rx OUT17	B7
	RSVD 1	25	TxIN23			2	Rx OUT23	Not connect
	RSVD 2	27	TxIN24	TA OUT3-	Rx 3-	3	Rx OUT24	Not connect
	RSVD 3	28	TxIN25			5	Rx OUT25	Not connect
	DCLK	31	TxCLK IN	TxCLK OUT+ TxCLK OUT-	RxCLK IN+ RxCLK IN-	26	RxCLK OUT	DCLK

R0~R7: Pixel R Data (7; MSB, 0; LSB)

G0~G7: Pixel G Data (7; MSB, 0; LSB)

B0~B7: Pixel B Data (7; MSB, 0; LSB)

DE: Data enable signal

Notes(1) RSVD(reserved)pins on the transmitter shall be "H" or "L".

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5.6 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

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6. INTERFACE TIMING

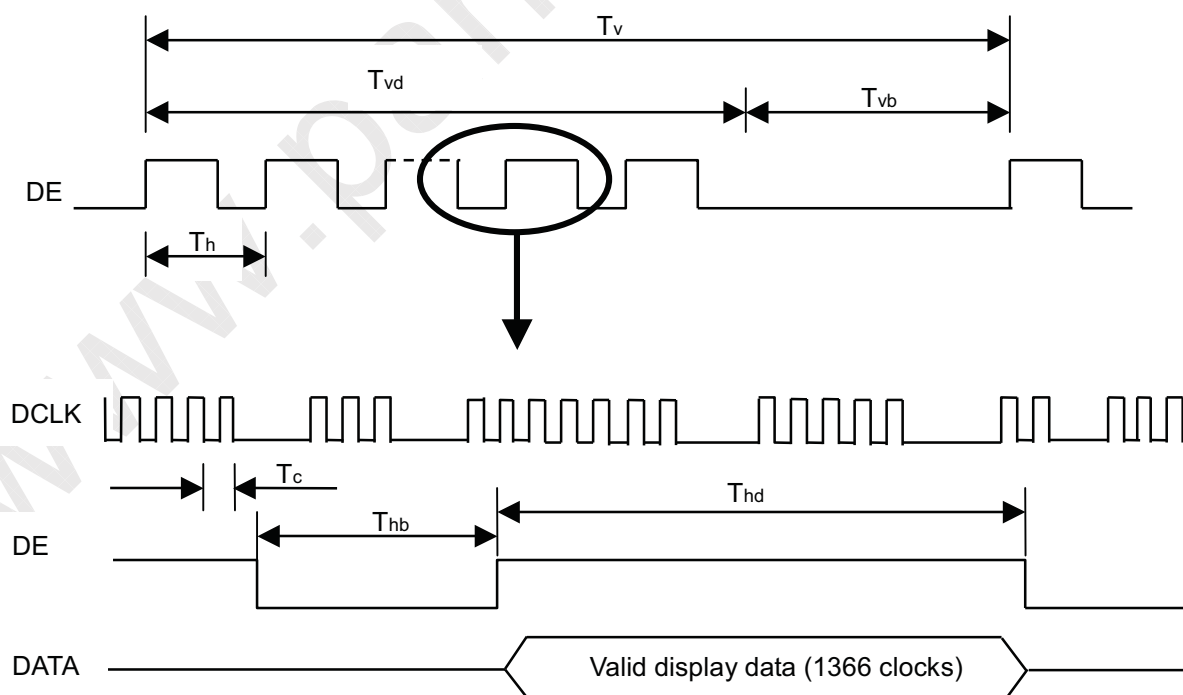### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.
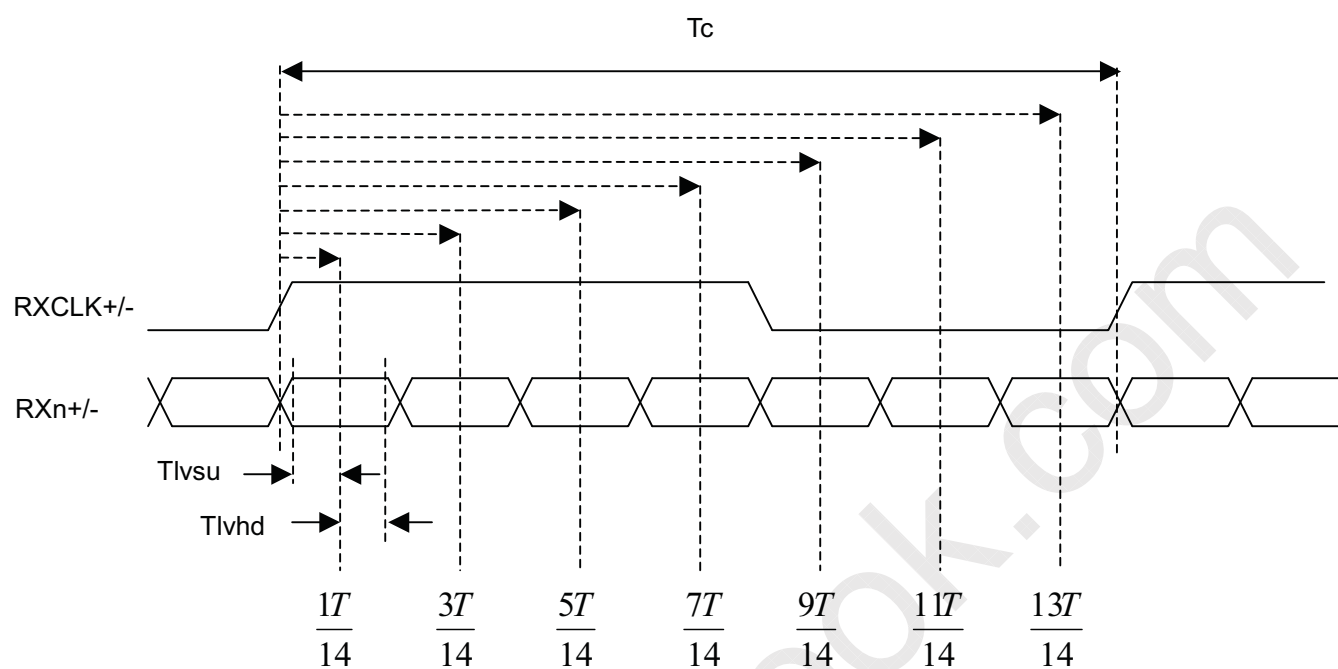
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock	Frequency	1/Tc	(65)	86	(88)	MHz	
	Input cycle to cycle Jitter	Trcl	-	-	200	ps	
LVDS Receiver Data	Setup Time	Tlvsu	600	-	-	ps	
	Hold Time	Tlvhd	600	-	-	ps	
Vertical Active Display Term	Frame Rate	Fr5	47	50	53	Hz	(2)
		Fr6	57	60	63	Hz	
	Total	Tv	(778)	795	(888)	Th	Tv=Tvd+Tvb
	Display	Tvd	768	768	768	Th	-
	Blank	Tvb	(10)	27	(120)	Th	-
Horizontal Active Display Term	Total	Th	(1442)	1798	(1936)	Tc	Th=Thd+Thb
	Display	Thd	1366	1366	1366	Tc	-
	Blank	Thb	(70)	432	(570)	Tc	-

Note (1) Since this module is operated in DE only mode, Hsync and Vsync input signals should be set to

low logic level. Otherwise, this module would operate abnormally.

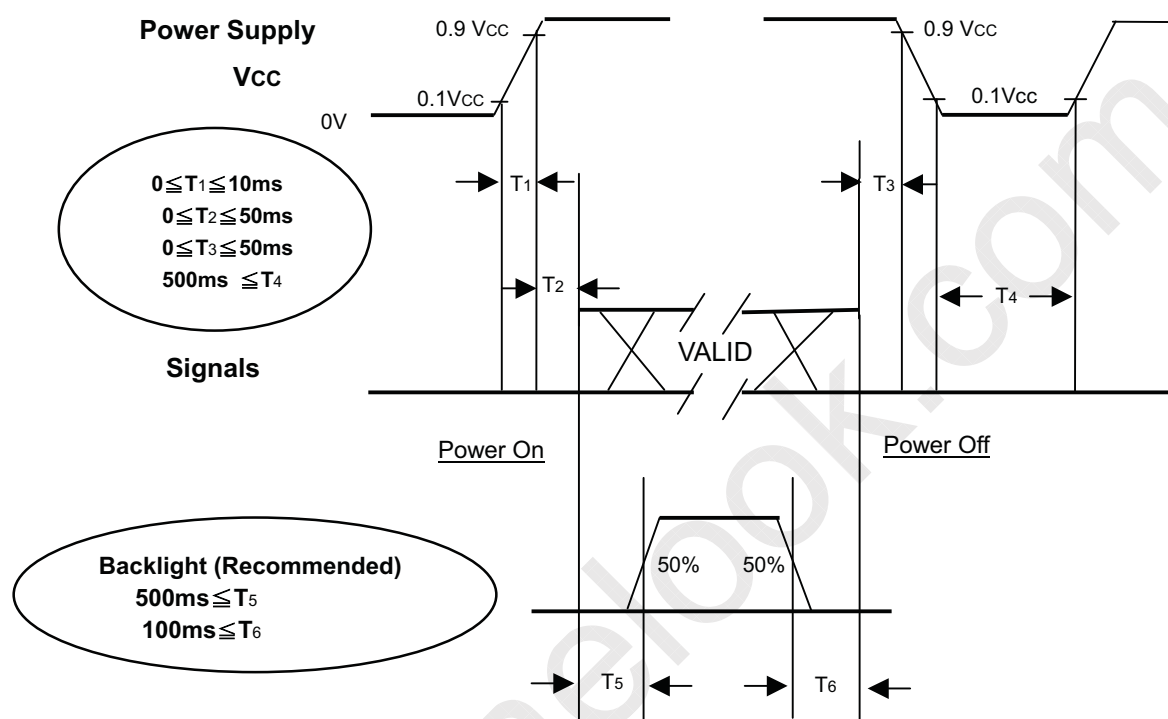(2) Please refer to 5.1 for detail information.

INPUT SIGNAL TIMING DIAGRAM

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LVDS RECEIVER INTERFACE TIMING DIAGRAM

Tc

RXCLK+/-

RXn+/-

Tlvsu

Tlvhd

$$\frac{1T}{14} \qquad \frac{3T}{14} \qquad \frac{5T}{14} \qquad \frac{7T}{14} \qquad \frac{9T}{14} \qquad \frac{11T}{14} \qquad \frac{13T}{14}$$

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6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.

Power Supply Vcc

$0 \leqq T_1 \leqq 10ms$
$0 \leqq T_2 \leqq 50ms$
$0 \leqq T_3 \leqq 50ms$
$500ms \leqq T_4$

Signals

0.9 Vcc
0.1Vcc
0V

T_1 T_2 T_3 T_4

VALID

Power On   Power Off

Backlight (Recommended)
$500ms \leqq T_5$
$100ms \leqq T_6$

50% 50%

T_5 T_6

Power ON/OFF Sequence

Note (1) The supply voltage of the external system for the module input should follow the definition of Vcc.

Note (2) Apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

Note (3) In case of Vcc is in off level, please keep the level of input signals on the low or high impedance.

Note (4) T4 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

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7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25 ± 2	$^{\circ}$C
Ambient Humidity	Ha	50 ± 10	%RH
Supply Voltage	V_{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I_L	5.5 ± 0.5	mA
Oscillating Frequency (Inverter)	F_W	52 ± 3	KHz
Frame Rate	Fr	60	Hz

7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should

be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR		800	1000	-	-	(2)
Response Time		Gray to gray average		-	8	12	ms	(3)
Center Luminance of White		L_C		400	500	-	cd/m^2	(4)
Average Luminance of White		L_{AVE}		400	500	-	cd/m^2	
White Variation		δW	$\theta_x=0^{\circ}$, $\theta_Y=0^{\circ}$	-	-	1.3	-	(7)
Cross Talk		CT	Viewing Normal Angle	-	-	4.0	%	(5)
Color Chromaticity	Red	Rx		0.620	0.650	0.680	-	(6)
		Ry		0.300	0.330	0.360	-	
	Green	Gx		0.244	0.274	0.304	-	
		Gy		0.562	0.592	0.622	-	
	Blue	Bx		0.113	0.143	0.173	-	
		By		0.032	0.062	0.092	-	
	White	Wx		0.242	0.272	0.302	-	
		Wy		0.248	0.278	0.308	-	
	Color Gamut	CG		72	75		%	NTSC
Viewing Angle	Horizontal	θ_x+	CR$\geq$20	80	88	-	Deg.	(1)
		θ_x-		80	88	-		
	Vertical	θ_Y+		80	88	-		
		θ_Y-		80	88	-		

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Note (1) Definition of Viewing Angle (θx, θy):

    Viewing angles are measured by EZ-Contrast 160R (Eldim)

Normal

$\theta x = \theta y = 0°$

$\theta y-$ $\theta y+$

$\theta x- = 90°$ x-

12 o'clock direction

$\theta y+ = 90°$

$\theta x-$ y+

$\theta x+$

6 o'clock

y-

$\theta y- = 90°$

x+ $\theta x+ = 90°$
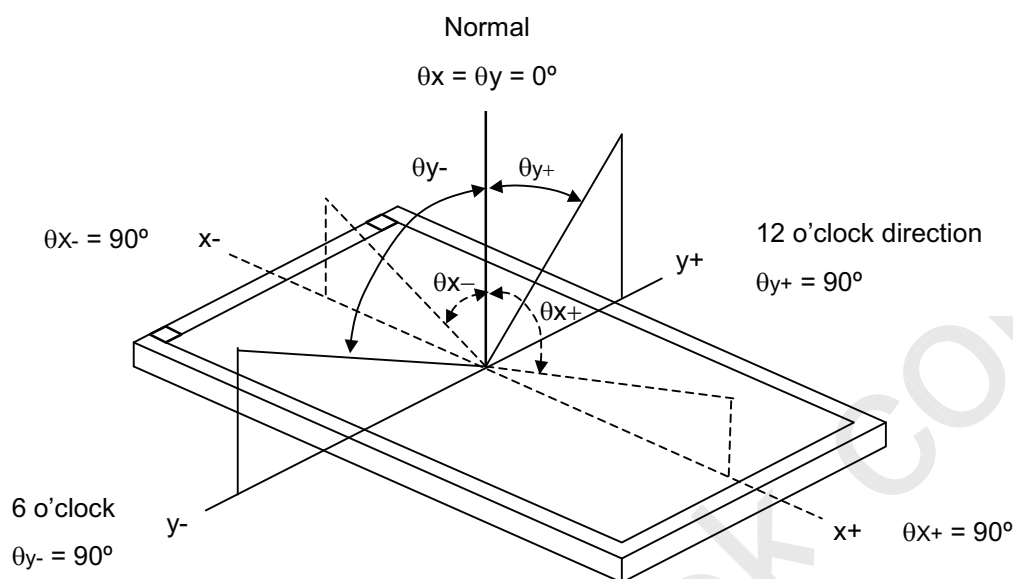
Note (2) Definition of Contrast Ratio (CR):

    The contrast ratio can be calculated by the following expression.

        Contrast Ratio (CR) = L255 / L0

        L255: Luminance of gray level 255

        L 0: Luminance of gray level 0

        CR = CR (5)

        CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (7).

Note (3) Definition of Gray to Gray Switching Time :

Optical

Response

100%
90%

10%
0%

Gray to gray
switching time

Gray to gray
switching time
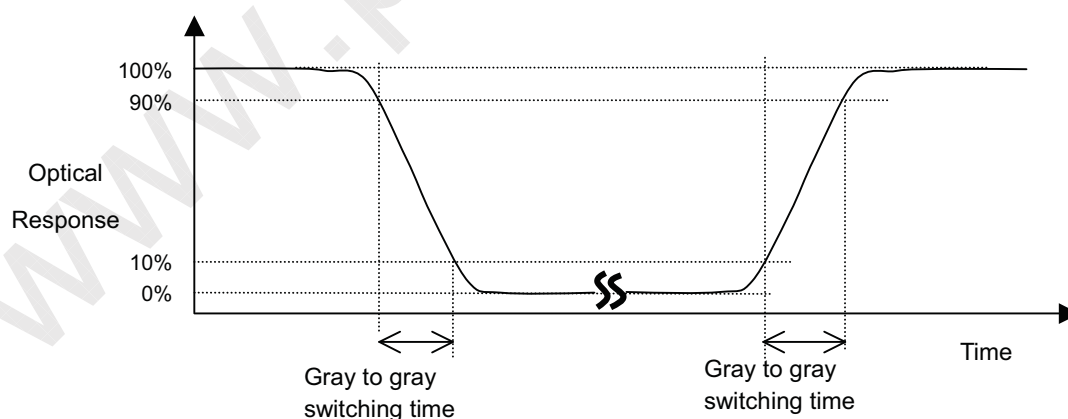
Time

    The driving signal means the signal of gray level 0, 63, 127, 191, 255.

    Gray to gray average time means the average switching time of gray level 0 ,63,127,191,255 to each

    other .

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Note (4) Definition of Luminance of White (L_C, L_{AVE}):

Measure the luminance of gray level 255 at center point and 5 points

$L_C = L\ (5)$

$L_{AVE} = [L\ (1) + L\ (2) + L\ (3) + L\ (4) + L\ (5)] / 5$

L (x) is corresponding to the luminance of the point X at the figure in Note (7).

Note (5) Definition of Cross Talk (CT):

$CT = |\ Y_B - Y_A\ | / Y_A \times 100\ (\%)$

Where:

Y_A = Luminance of measured location without gray level 0 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 0 pattern (cd/m^2)
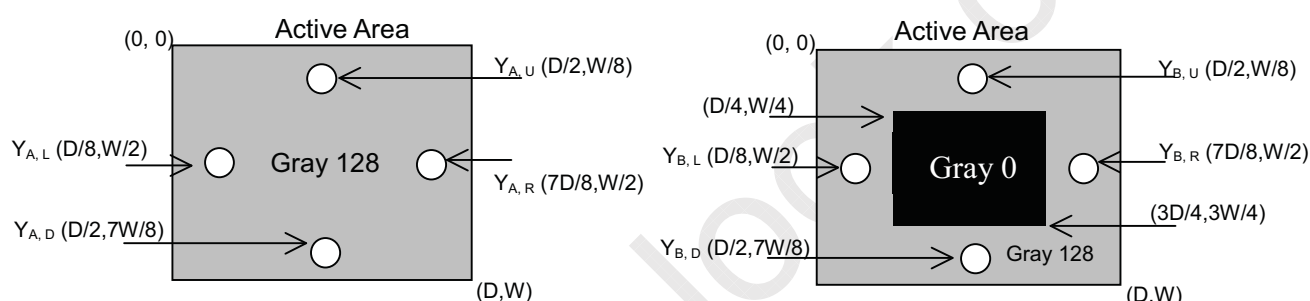
Note (6) Measurement Setup:

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.

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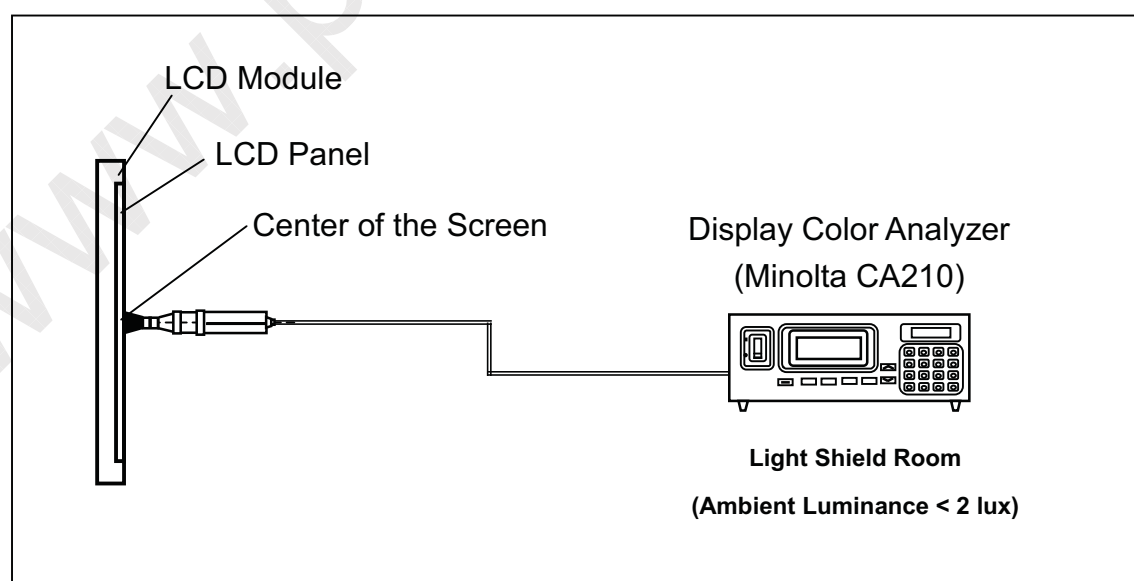
Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]

Horizontal Line

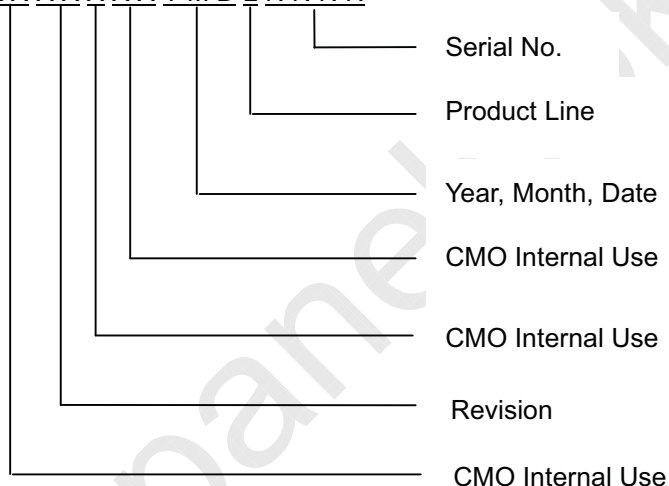Active Area

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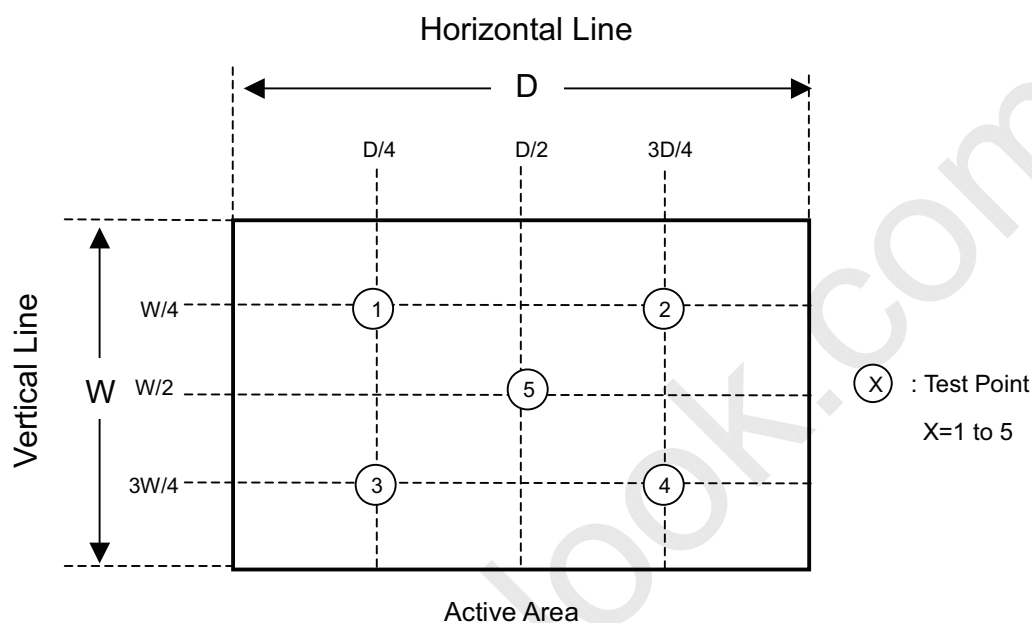
8. DEFINITION OF LABELS

8.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.
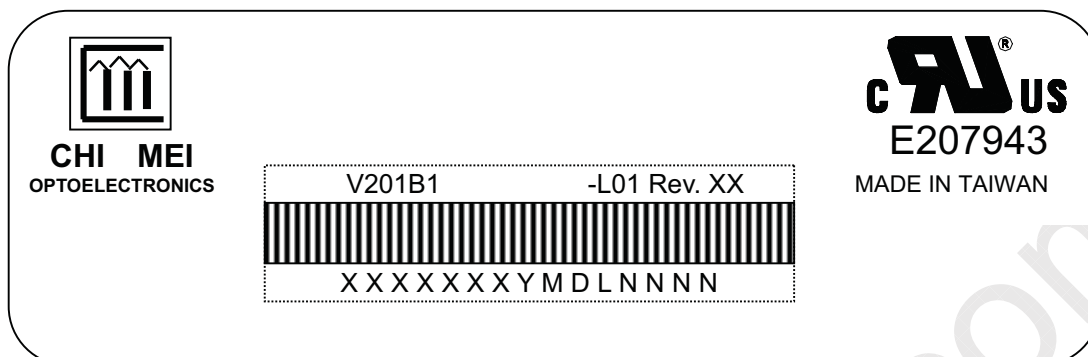
(a) Model Name: V201B1-L01

(b) Revision: Rev. XX, for example: A0, A1… B1, B2… or C1, C2…etc.

(c) Serial ID: X X X X X X X Y M D L N N N N

                    Serial No.

                    Product Line

                    Year, Month, Date

                    CMO Internal Use

                    CMO Internal Use

                    Revision

                    CMO Internal Use

Serial ID includes the information as below:

   (a) Manufactured Date: Year: 0~9, for 2000~2009

                      Month: 1~9, A~C, for Jan. ~ Dec.

                      Day: 1~9, A~Y, for 1st to 31st, exclude I ,O, and U.

   (b) Revision Code: Cover all the change

   (c) Serial No.: Manufacturing sequence of product

   (d) Product Line: 1 -> Line1, 2 -> Line 2, …etc.

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9. PACKAGING

9.1 PACKING SPECIFICATIONS

(1) 5 LCD TV modules / 1 Box

(2) Box dimensions : 566(L) X 428 (W) X 387 (H)

(3) Weight : approximately 14Kg (5 modules per box)

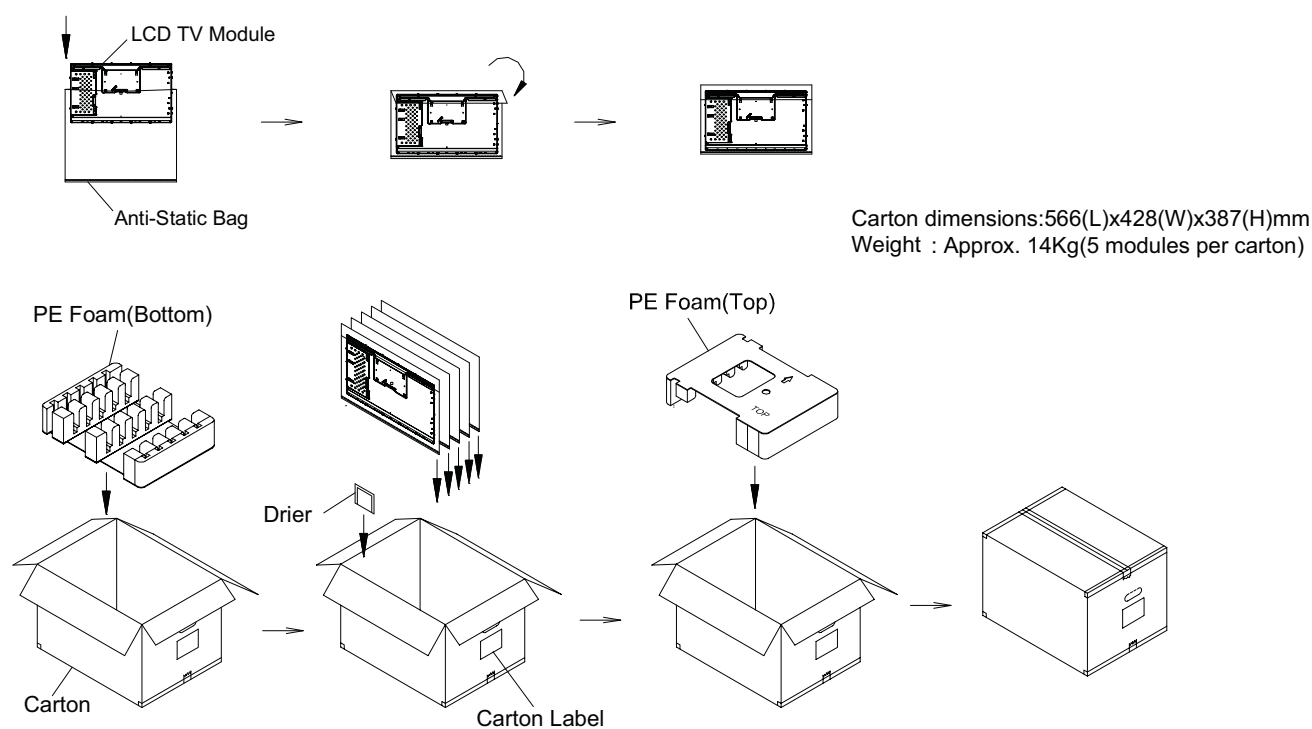### 9.2 PACKING METHOD

Figures 9-1 and 9-2 are the packing method

Carton dimensions:566(L)x428(W)x387(H)mm
Weight : Approx. 14Kg(5 modules per carton)

Figure.9-1 packing method

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Corner Protector:L1170*50mm*50mm

Pallet:L1300*W1140*H143mm
Corrugated Fiberboard:L1300*W1140mm
Pallet Stack:L1300*W1140*H1304mm
Gross:270kg
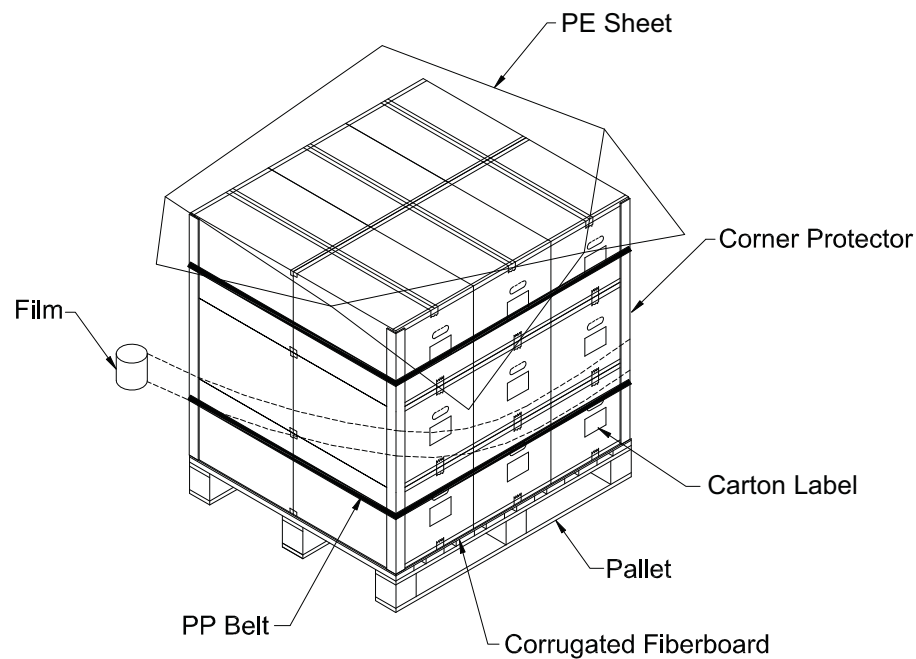
Figure. 9-2 packing method
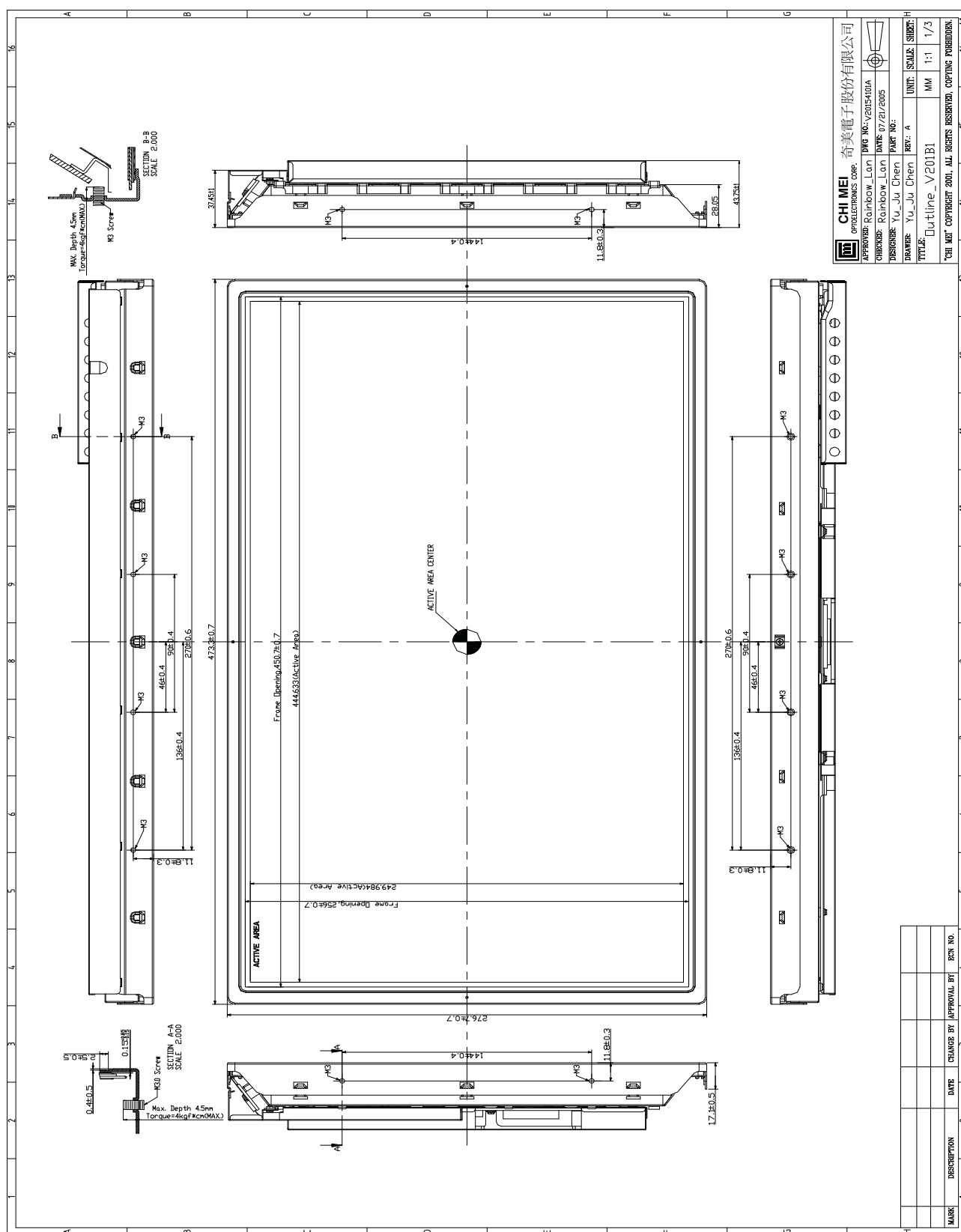
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10. PRECAUTIONS

10.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) Do not apply pressure or impulse to the module to prevent the damage of LCD panel and backlight.

(4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

(5) Do not plug in or pull out the I/F connector while the module is in operation.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) Moisture can easily penetrate into LCD module and may cause the damage during operation.

(9) High temperature or humidity may deteriorate the performance of LCD module. Please store LCD modules in the specified storage conditions.

(10) When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

10.2 SAFETY PRECAUTIONS

(1) The startup voltage of a backlight is over 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the backlight unit.

(2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

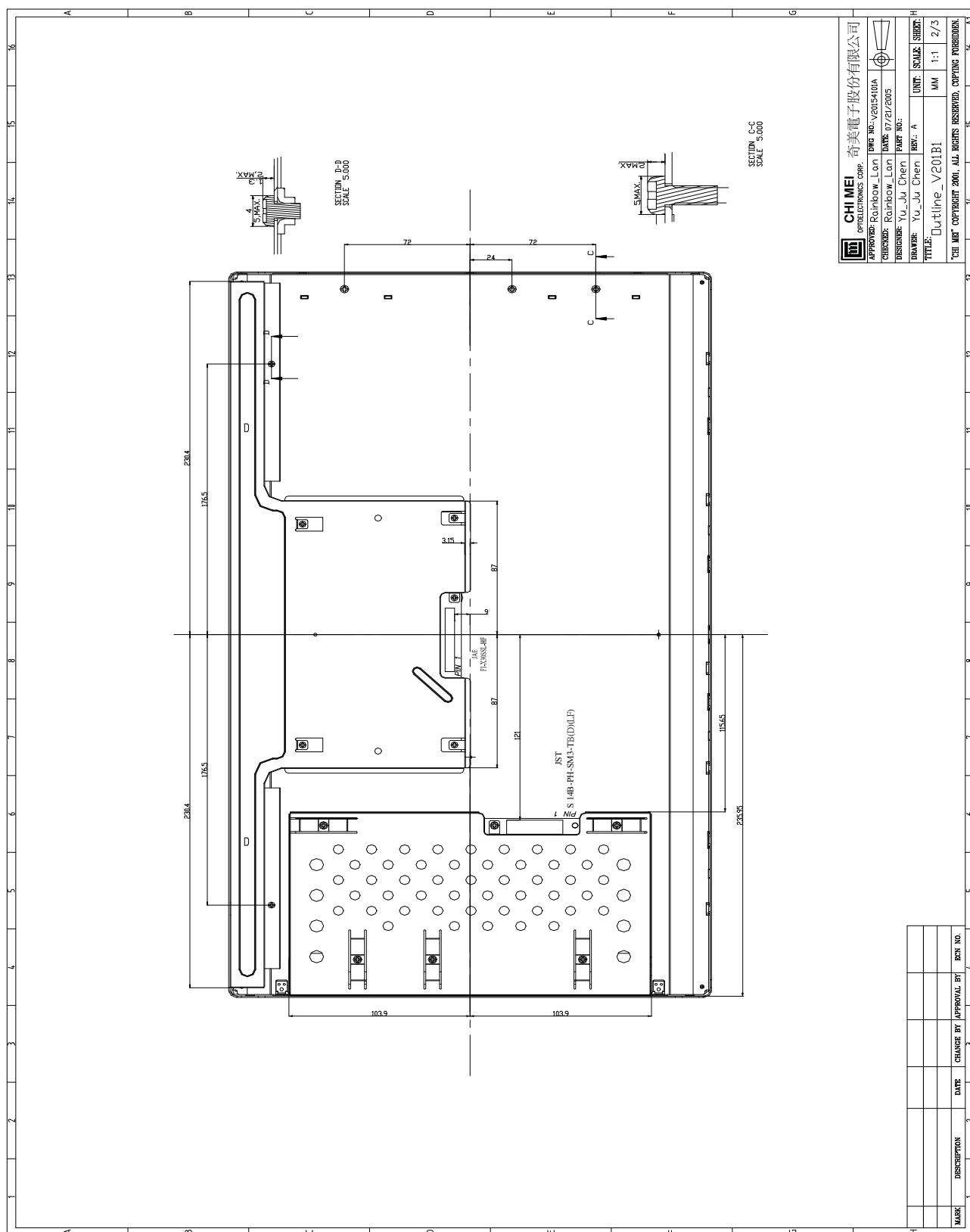(3) After the module's end of life, it is not harmful in case of normal operation and storage.
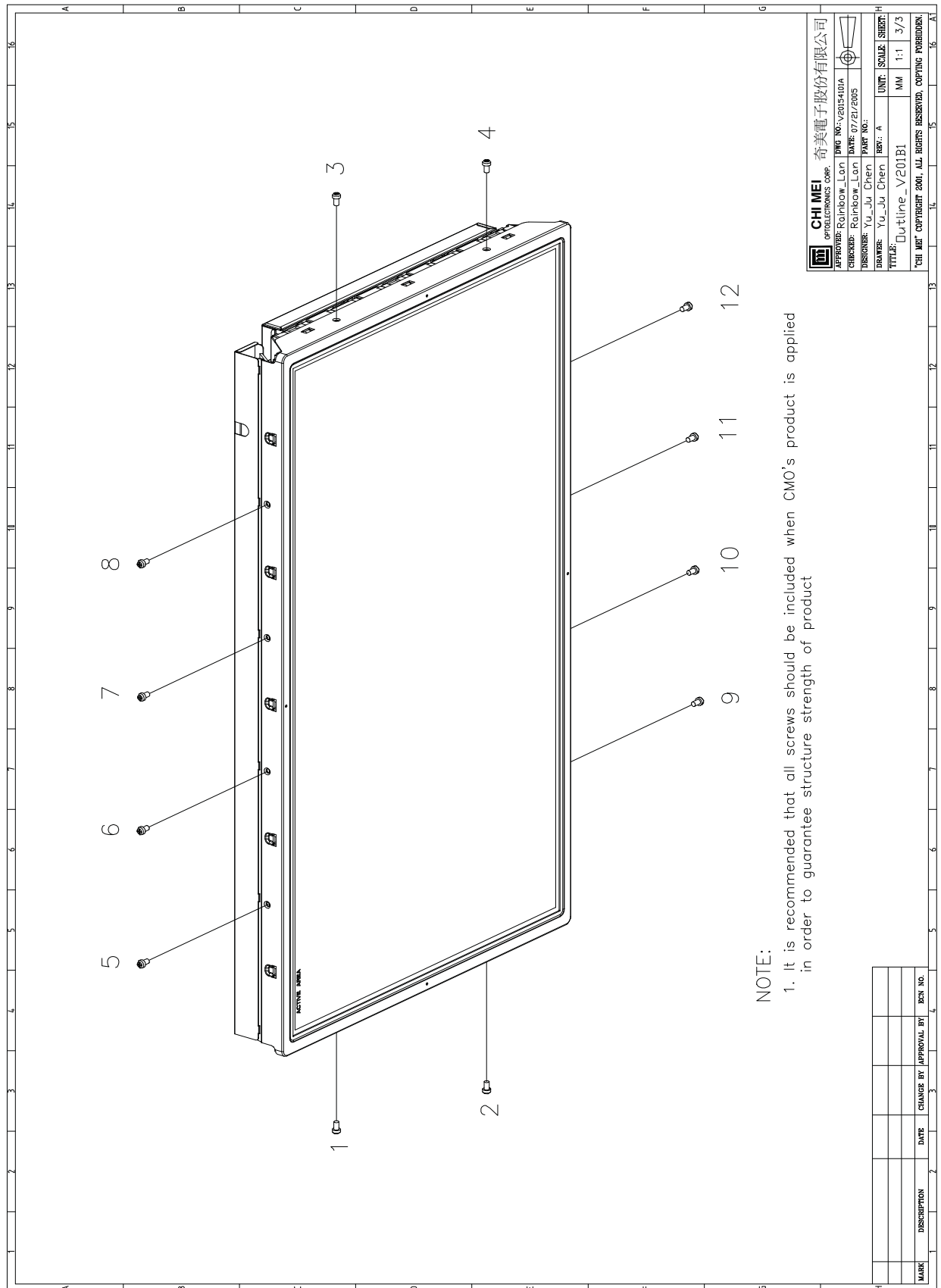
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11. MECHANICAL CHARACTERISTICS

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NOTE:
1. It is recommended that all screws should be included when CMO's product is applied in order to guarantee structure strength of product

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APPROVED: Rainbow_Lan	DWG NO.: V2015410lA
CHECKED: Rainbow_Lan	DATE: 07/21/2005
DESIGNER: Yu_Ju Chen	PART NO.:
DRAWER: Yu_Ju Chen	REV.: A

TITLE: Outline_V201B1

UNIT: MM   SCALE: 1:1   SHEET: 3/3

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